

Climate and Sea Level Scenarios for California

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sponsors:

California Energy Commission PIER program

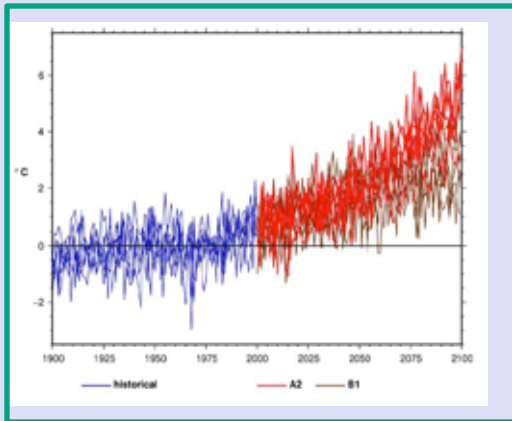
California Ocean Protection Council

NOAA OGP RISA element

<http://meteora.ucsd.edu/cap>

Climate and Sea Level Rise Scenarios

Cayan et al., (Scripps, Santa Clara University)

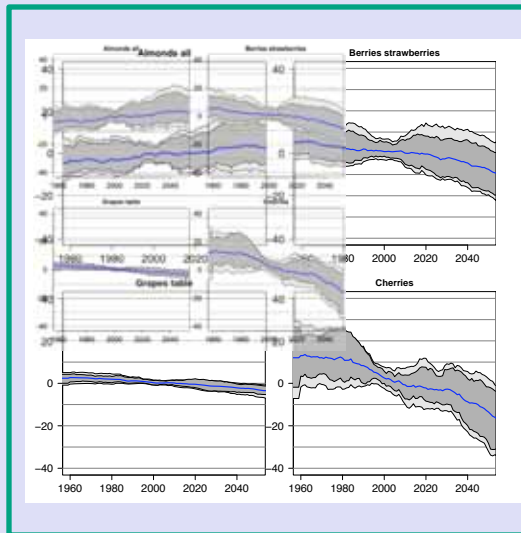


Sanstad et al., (LBNL, PPIC, LLLN, CEC)



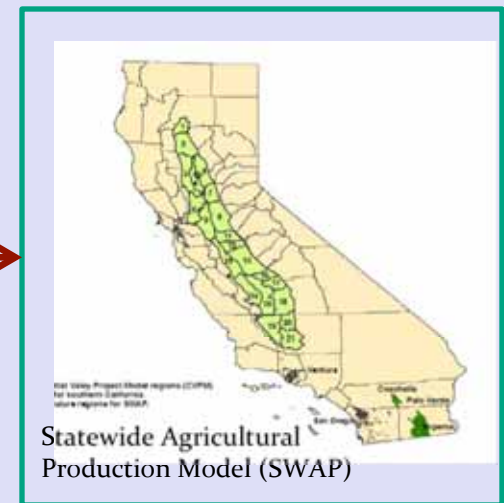
Demographic and Urban Projections

Physical Impacts



Lobell and Field (Stanford)

Economic Outcomes

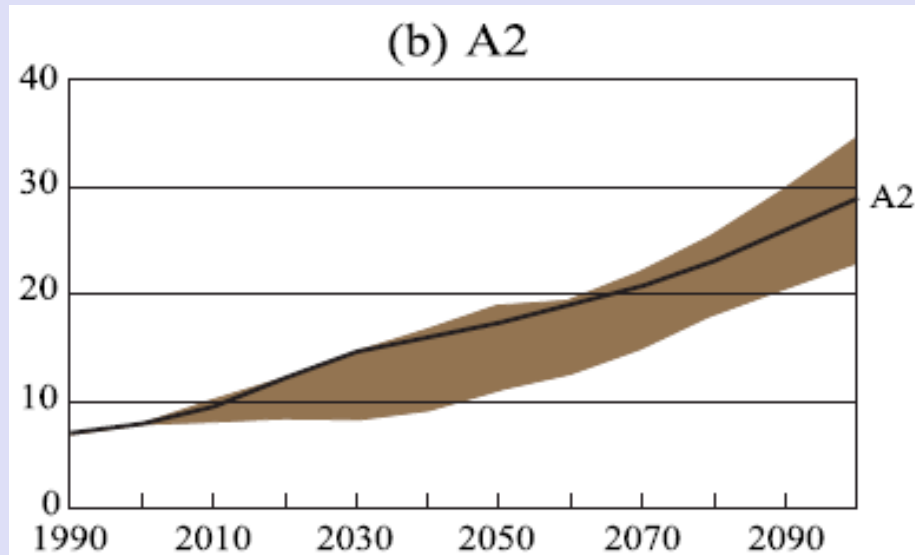


Howitt et al. (UC Davis)

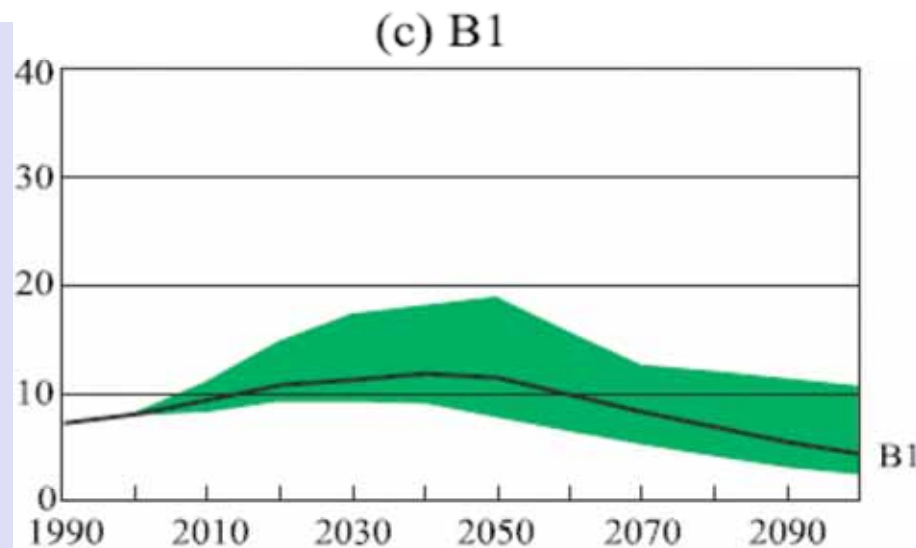
Uncertainty

SRES A2 and B1 Scenarios: Global carbon dioxide emissions

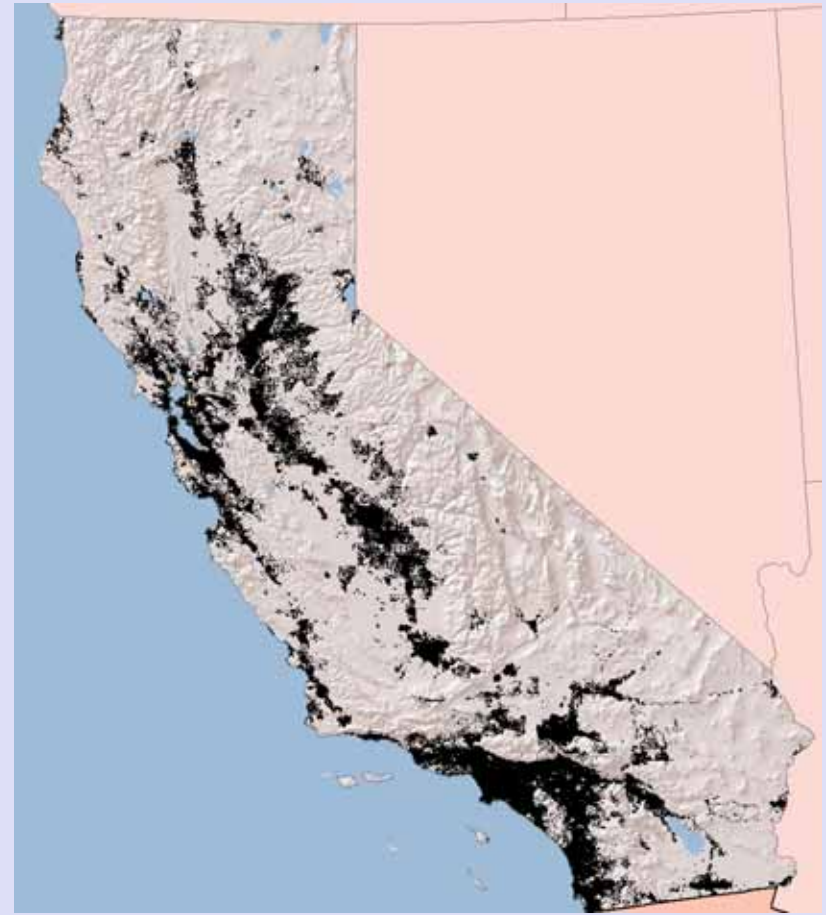
Global carbon dioxide
emissions (GtC/yr)

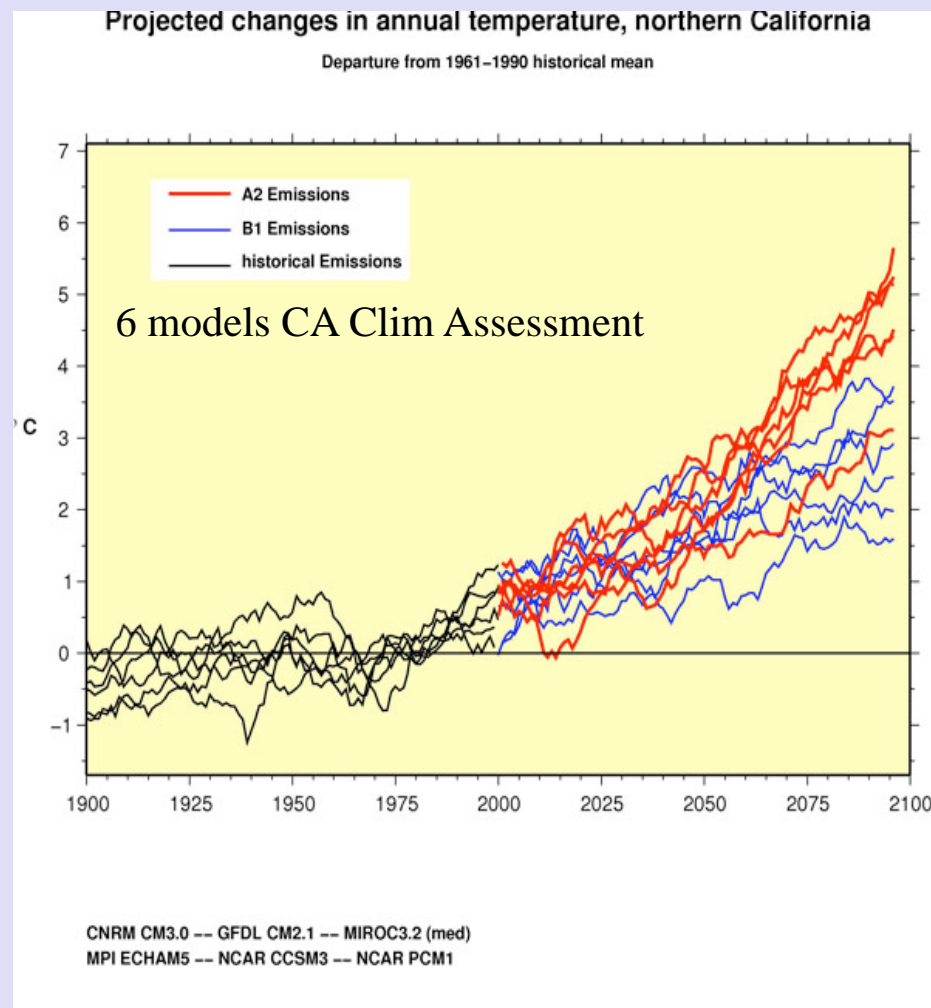


Global carbon dioxide
emissions (GtC/yr)

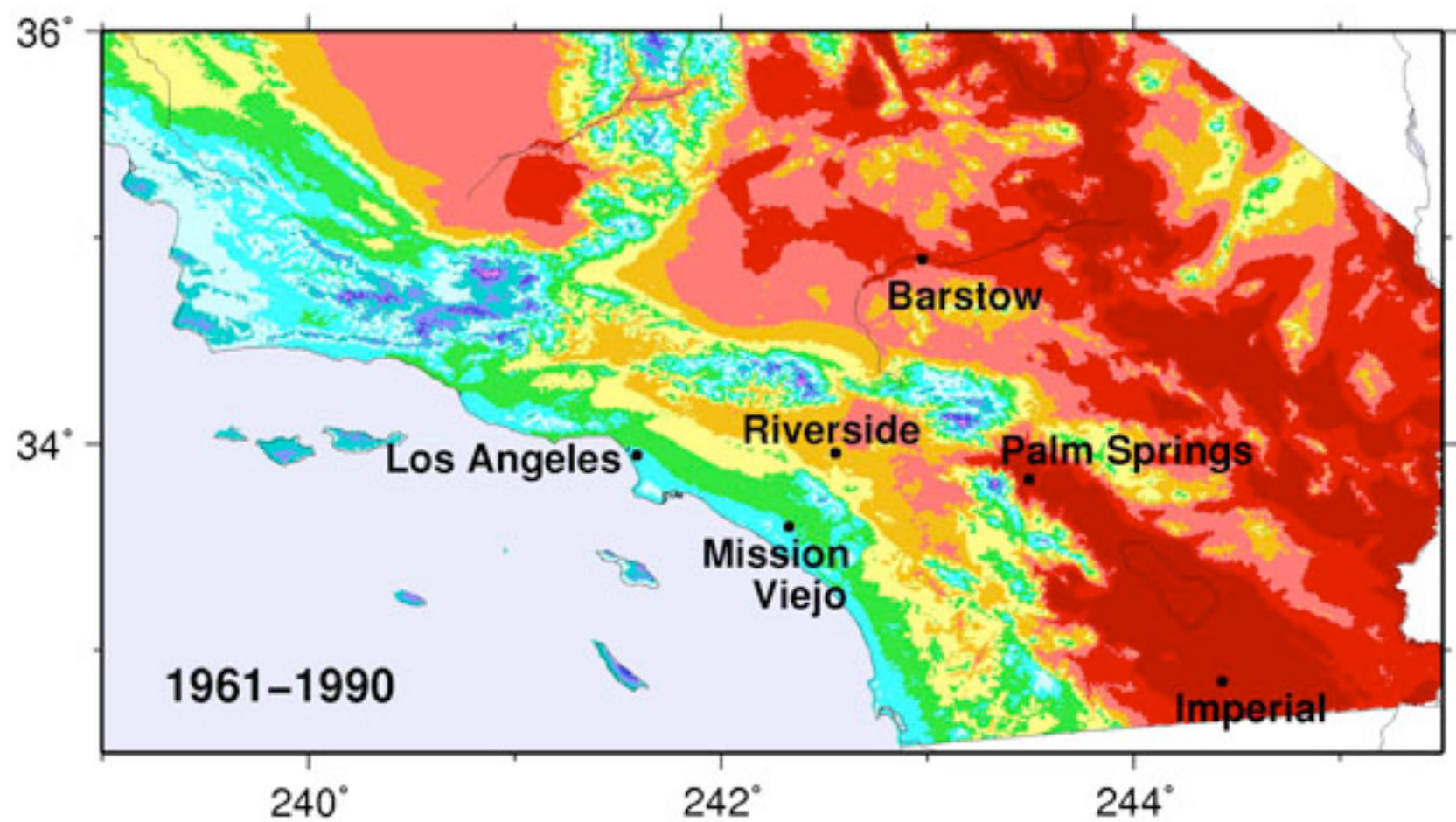


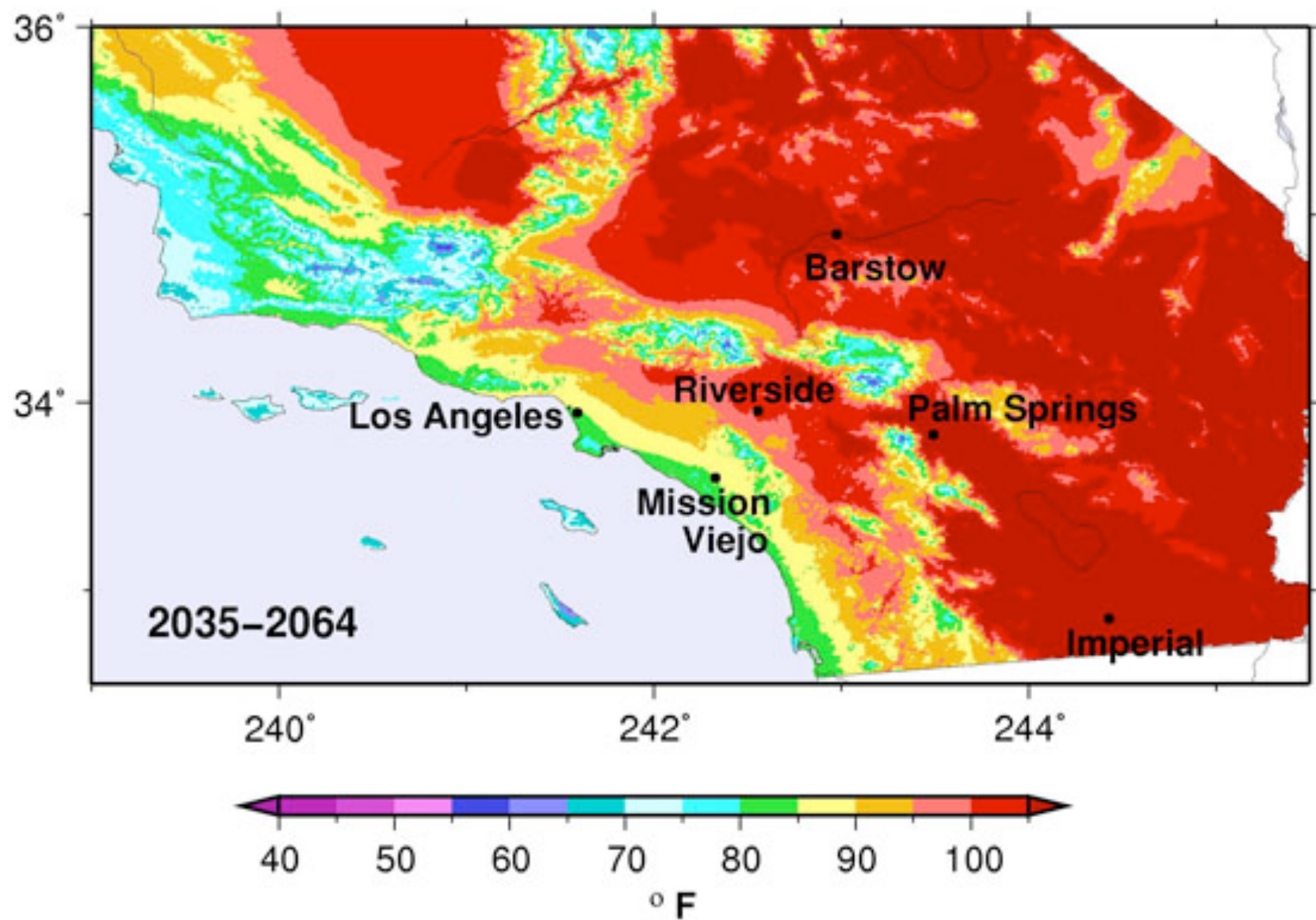
Example: Urban “footprint,” 2000 and 2100





All simulations warm over the 21st Century, at very substantial rates
A2 simulations (red) warm more than B1 simulations (blue)
6 models selected for California Assessment are
representative of larger population of IPCC AR4 models





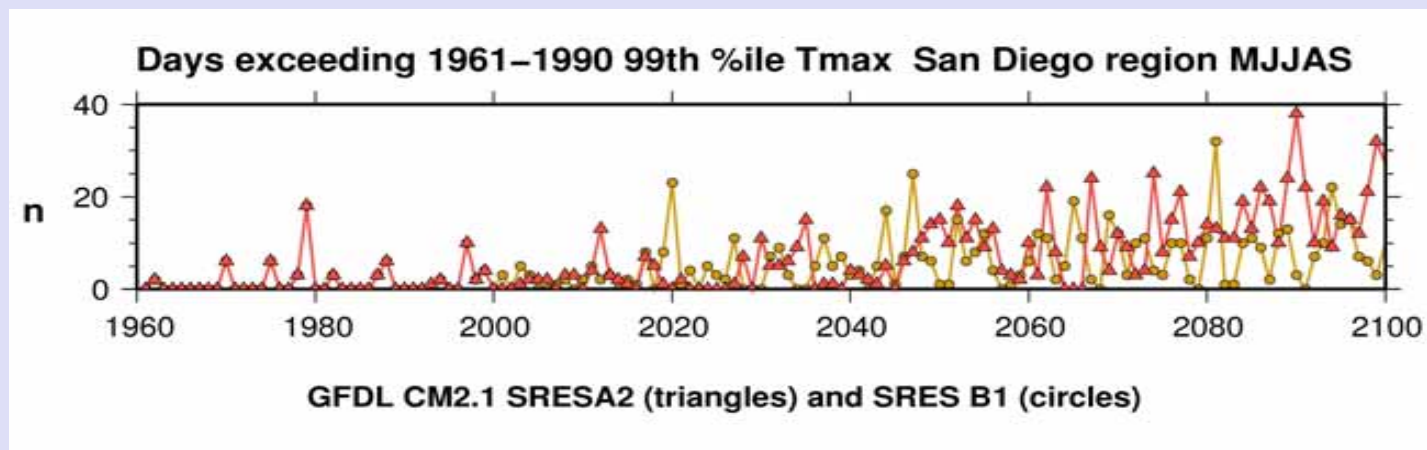
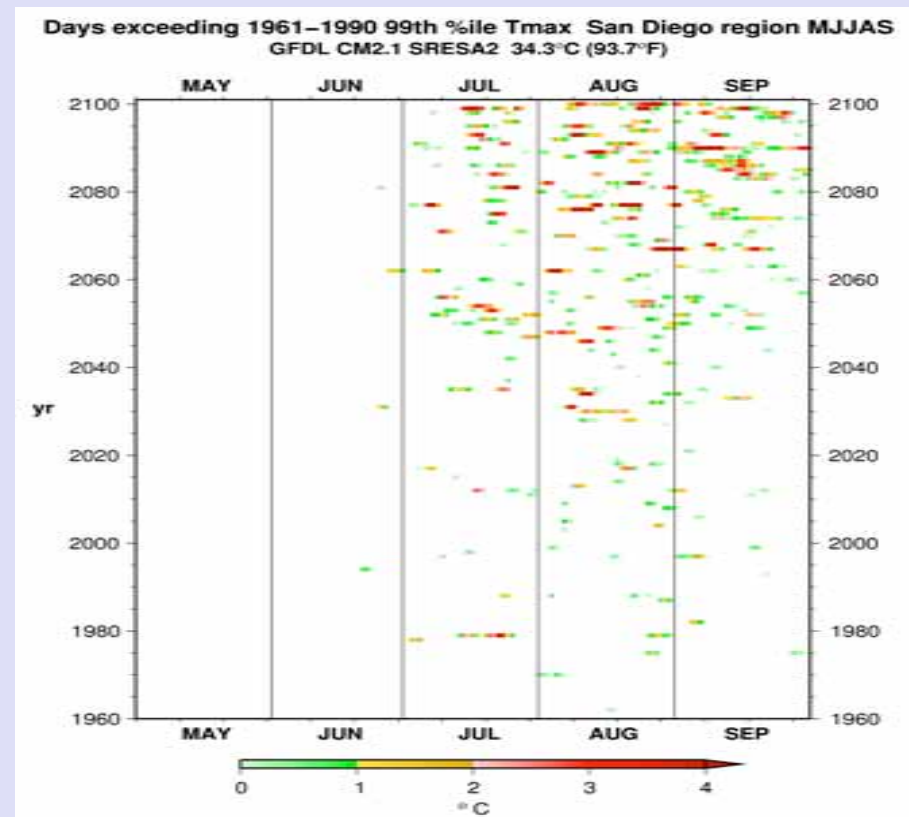
GFDLA2 1km downscaled to 1km
Hugo Hidalgo Tapash Das Mike Dettinger

California Heat Waves

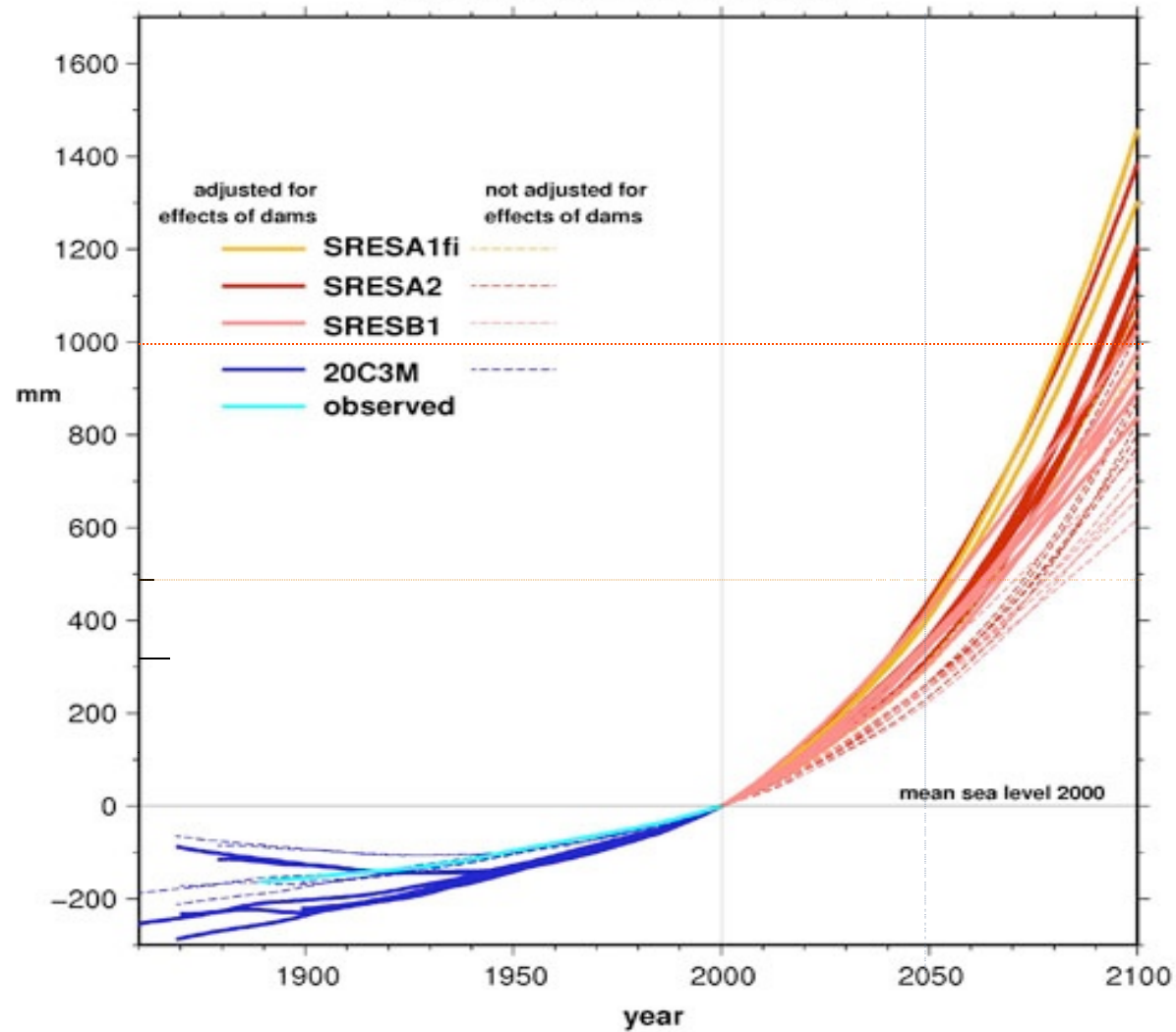
GFDL A2 Simulation

latest generation of GCMs
Indicate that summers warm
more than winters

Heat Wave frequency and
intensity increases markedly,
but depends on which
emissions scenario and
which GCM



Global sea level projections



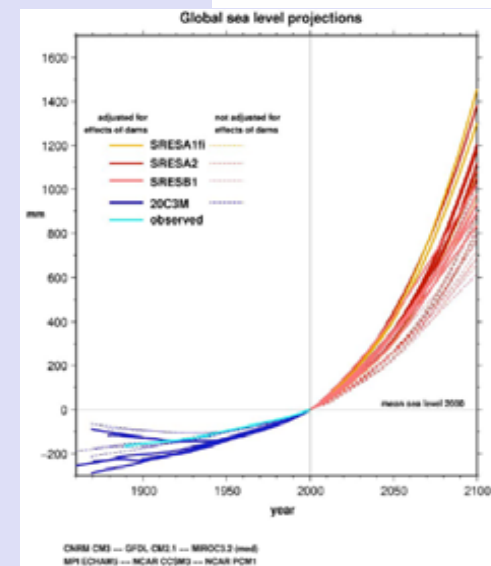
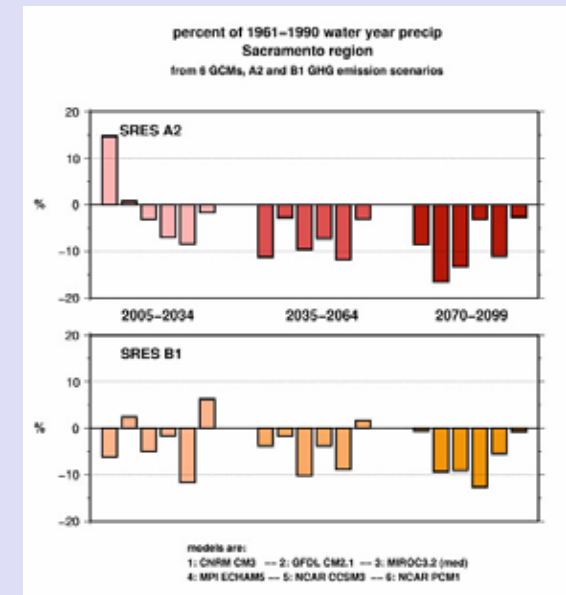
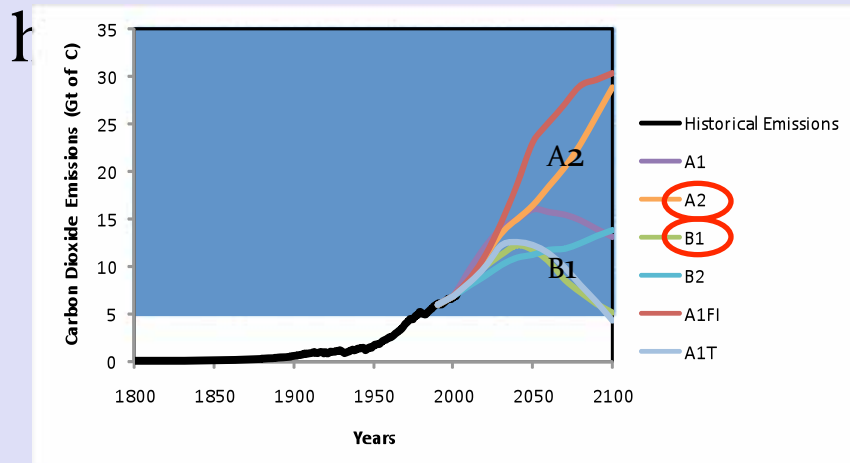
CNRM CM3 --- GFDL CM2.1 --- MIROC3.2 (med)
MPI ECHAM5 --- NCAR CCSM3 --- NCAR PCM1

after Rahmstorf (2007) Science VOL 315 pp 368-370
Chao et al. (2008) Scienceexpress 13 March 2008 10.1126/science.1154580

Climate and Sea Level Rise Scenarios:

What is new?

- 6 models—several more than in 2006 Assessment
- Drying trends by mid-century
- Updated sea level projections



2006 Assessment

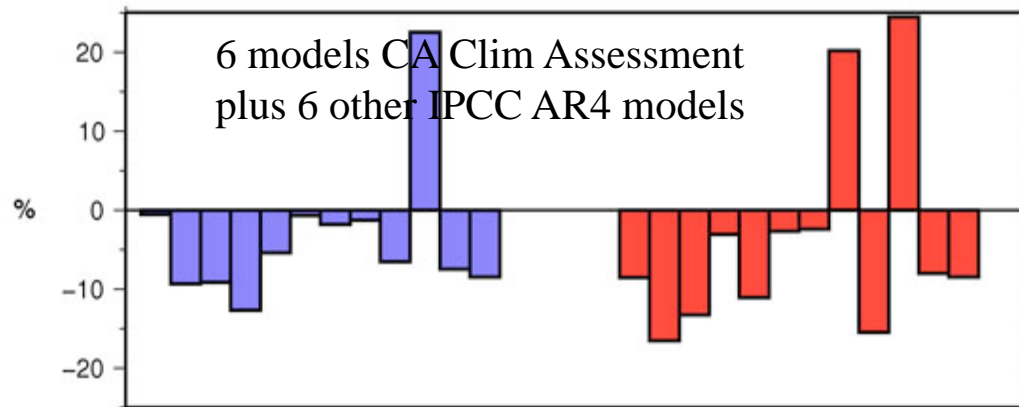
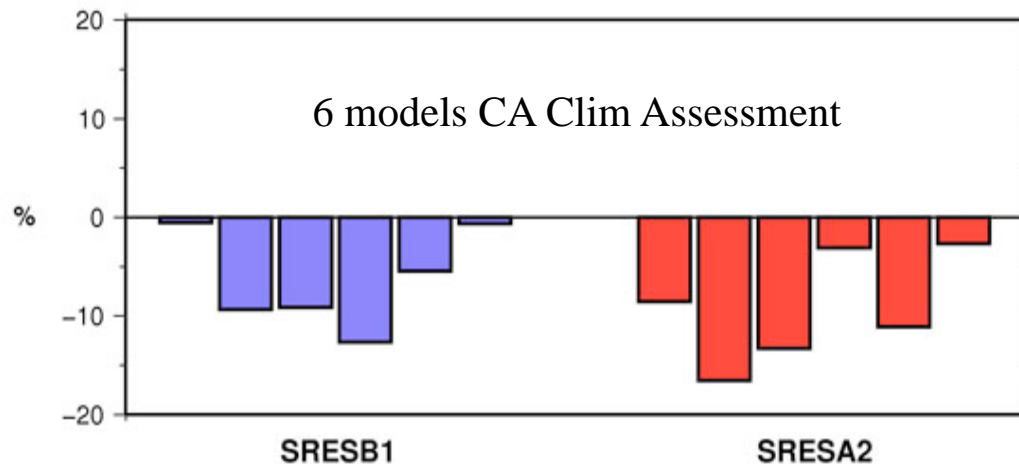
This Report:

Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment Publication CEC-500-2009-014-D. 62 pp. 2.2 megabytes

www.climatechange.ca.gov/publications/cat/

THANK YOU

2070–2099 percent of 1961–1990 water year precip
 Sacramento region
 from 12 GCMs, SRES A2 and SRES B1 GHG emission scenarios



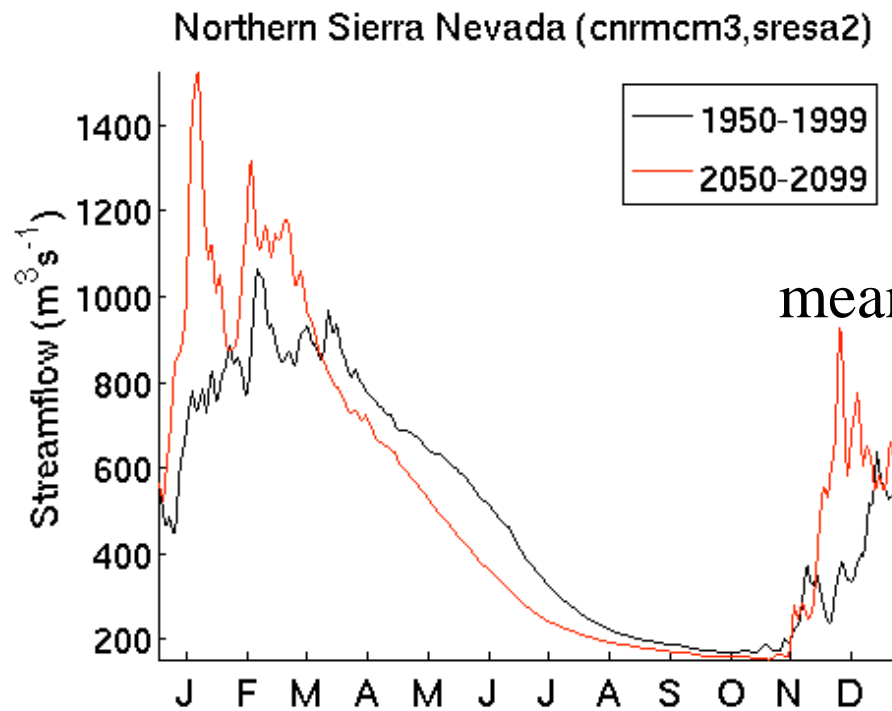
models are:

- | | | |
|---------------|-----------------|-------------------|
| 1: CNRM CM3 | 2: GFDL CM2.1 | 3: MIROC3.2 (med) |
| 4: MPI ECHAM5 | 5: NCAR CCSM3 | 6: NCAR PCM1 |
| 7: CCC CGCM3 | 8: CSIRO Mk3.0 | 9: GFDL CM2.0 |
| 10: IPSL CM4 | 11: UKMO HadCM3 | 12: UKMO HadGEM |

6 climate models
 employed in the
 Scenarios Assessment
 were heavily shaded
 toward drying in central
 California.

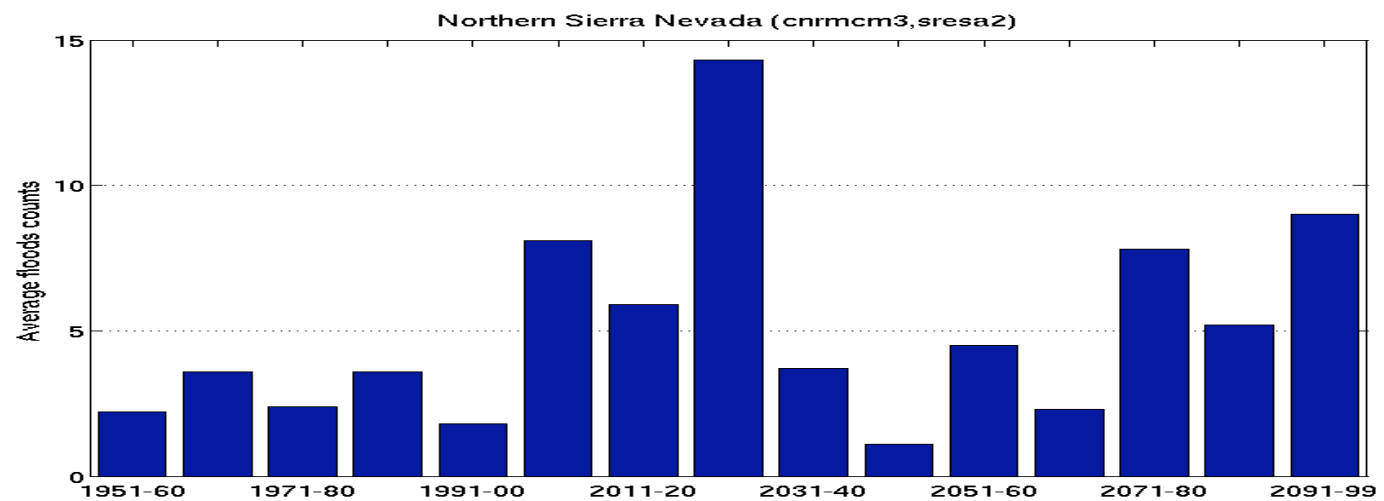
A larger set of 12 climate
 IPCC models do contain two
 simulations having wetter
 conditions at end of 21st
 Century, but the consensus
 reinforces concerns over a
 drier future.

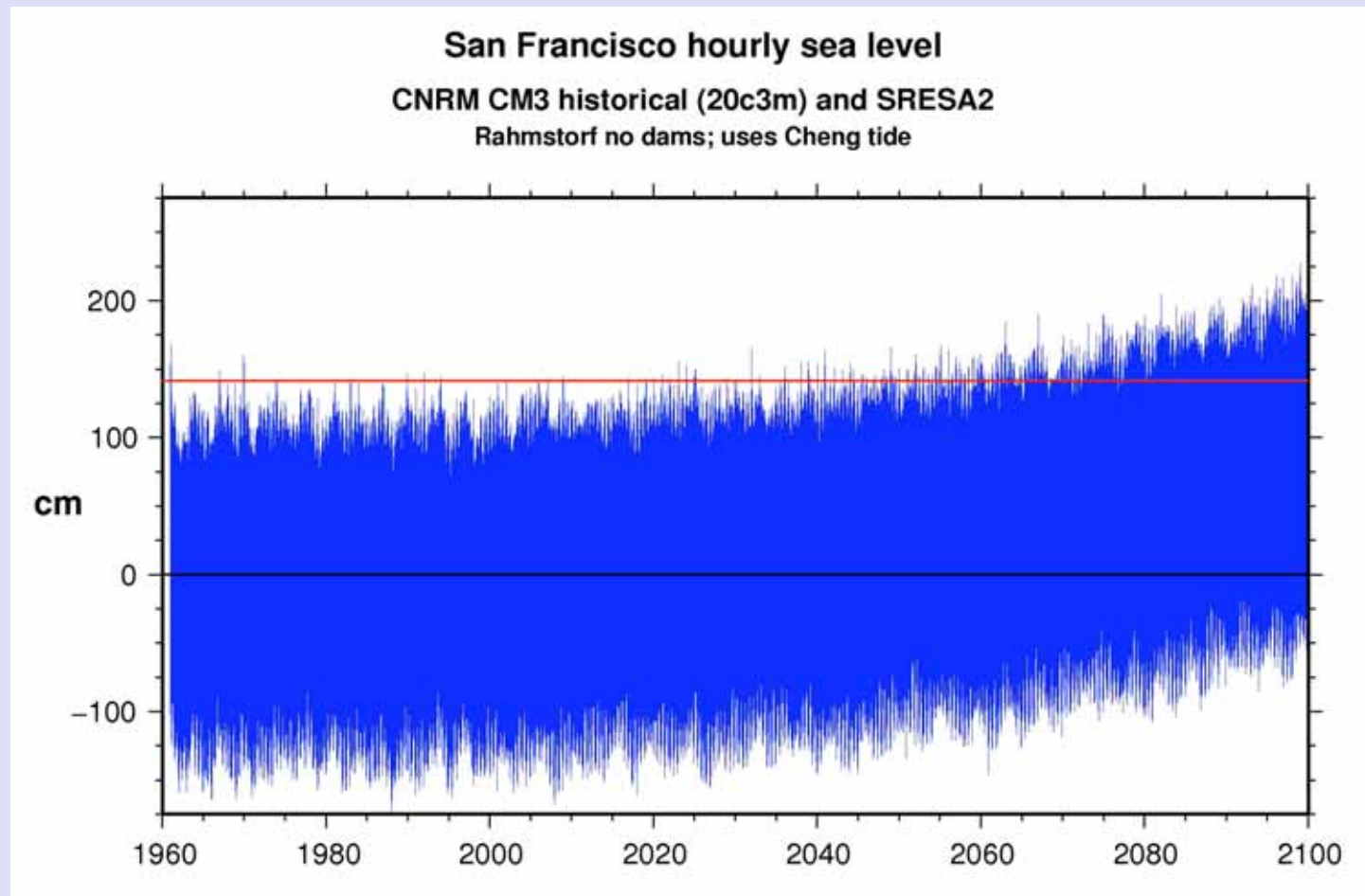
In Southern California,
 magnitude of drying
 tendencies was increased



mean hydrographs CNRM A2
Northern Sierra becomes
more flood-prone

99th percentile streamflow events come twice as often





San Francisco sea level CNRM A2 using Rahmstorf scheme
99.99th level (1961-1990) shown in red

Global societal and emission scenario themes

- **A2**: Disparities in regional development patterns; high global population growth; relatively low economic growth
- **B1**: Convergence of development patterns; low population growth; relatively high economic growth; global emphasis on environmental sustainability
 - *No global CO₂ policy, but significant moderation of emissions*